

## Lighting Zones

Lisa Heschong, Architect, LC  
*Heschong Mahone Group*



## Issues

- IESNA and CIE recognize need for lighting zones:
  - A four-zone system will be consistent with future IESNA and international design standards.
- California lighting zones.
  - LZ1 = areas of intrinsic darkness.
  - LZ2 = rural areas, areas of low ambient brightness.
  - LZ3 = urban area, area of high ambient brightness.
  - LZ4 = special uses, areas of highest ambient brightness.



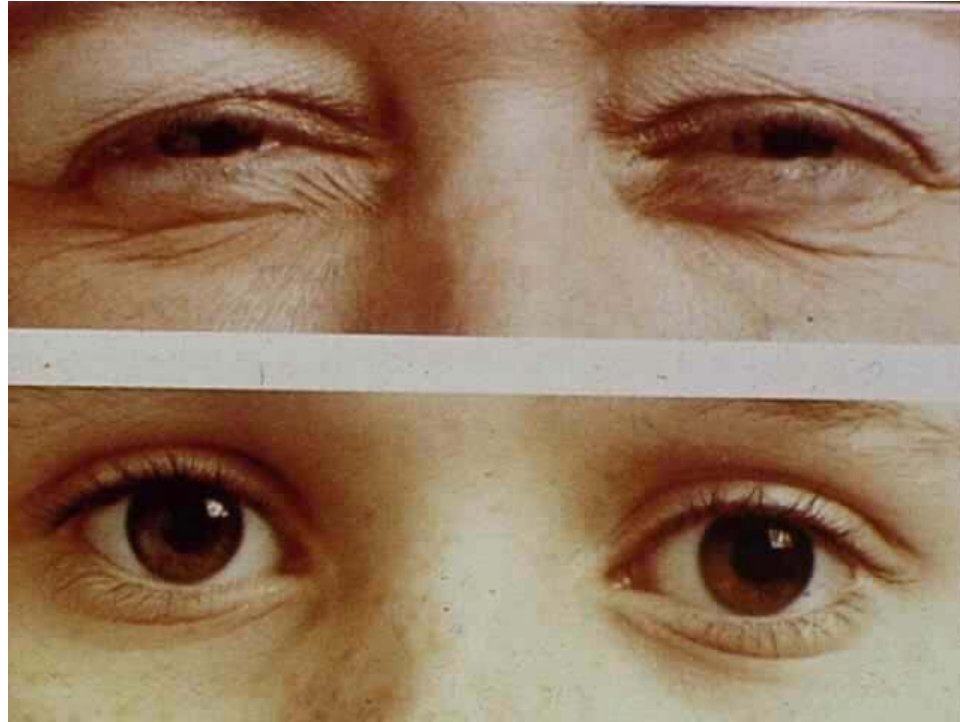
### Ambient Brightness



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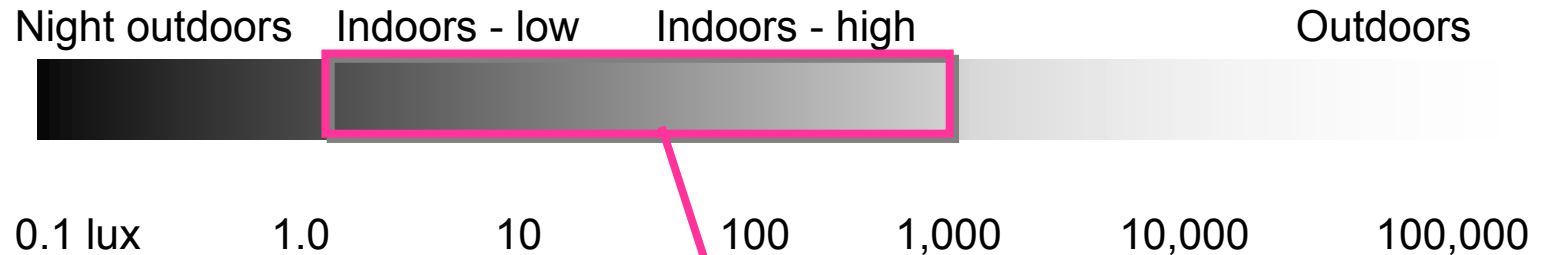
## Our eyes are highly adaptable



The IRIS of the eye and the eye's internal chemistry work together to allow humans to see over a wide range of scene illumination.

Older eyes lose some of their range of adaptation.

## Adaptation



But we can only see a *dynamic range* of about  $10^3$  at once. This is accomplished by the *iris* and takes only a second or two.

To adapt to much higher or much lower overall light levels, chemical changes must occur that can take up to an hour.

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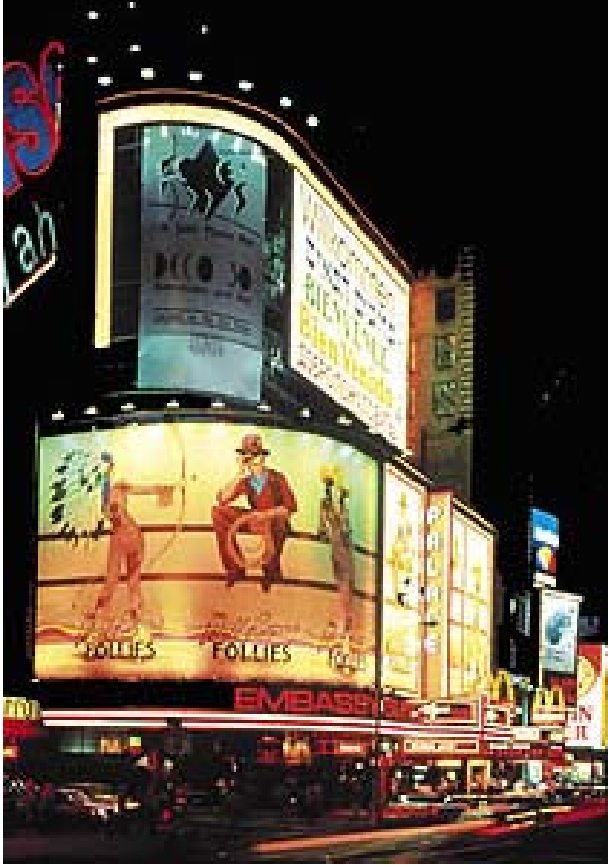
### Creeping Illumination



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### Light as Entertainment



Lighting Zones

## The Natural World of Darkness

- Needed for natural areas:
  - National and State Parks.
  - Wildlife preserves.
- Aesthetic appreciation of the night:
  - Starry skies.
  - Quiet residential areas.







## Goals

- Set energy metrics appropriate to intensity of human use.
- Allow for high intensity lighting uses.
  - Retail, entertainment, security needs.
- Allow for natural darkness.
  - Preserve adaptation levels.
  - Reduce need for competitive lighting ratchet effect.
- Allow local jurisdictions to adjust own standards.
  - Within a standardized approach.

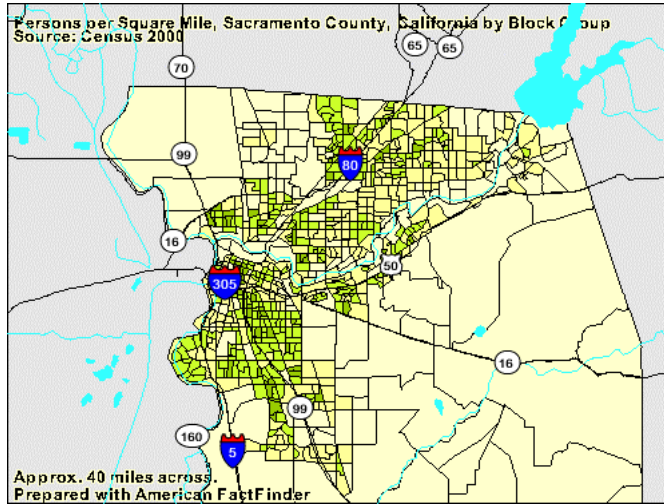


## Approach

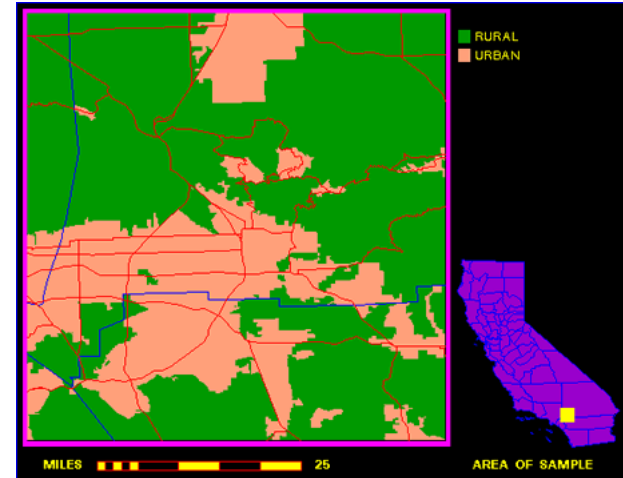
- Use standard geographic regions.
  - Related to intensity of human use.
  - Fine grain analysis.
  - Updated periodically.
  - May be legally referenced.
- US Census defines rural and urban areas.
  - Definition based on density of population.
  - Contiguous uses (no rural islands in urban areas).
  - Used for many state and federal designations.



## U.S. Census Urban- Rural Mapping



Determined by block group.



Mapped for state  
every 10 years.



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### Urban - Rural Areas 1990



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### Proposed LZ Areas

- LZ1 - State and national parks, recreational areas, wildlife preserves, special districts within LZ2 identified by local jurisdiction for lower ambient brightness.
- LZ2 – U.S. Census rural areas, special districts within LZ1 for higher brightness or LZ3 for lower brightness.
- LZ3 - US Census urban areas, special districts within LZ2 for higher brightness. Limits on special district area.
- LZ4 - special districts within LZ3 identified by local jurisdiction for high intensity nighttime use. Limits on special district area.



## Proposed LZ Rules

- LZ1-3 determined by default state mapping.
- LZ1-4 can be modified by local jurisdiction:
  - Adjusted to local preference, needs, development.
  - Limits on adjacencies of zones.
  - Limits on sized of special zones per local jurisdiction.
  - CEC can create web-enabled mapping of zones.
- Lighting Power Densities vary by zone.
- Control requirements vary by zone.

